



Appl. No. 10/422,200

VERSION WITH MARKING TO SHOW CHANGES MADE
IN THE SPECIFICATION

PINK LIGHT EMITTING DIODE
BACKGROUND OF THE INVENTION

5 Field of the invention

The present invention relates to a pink light emitting diode used in LED display, back light, traffic signal, indicator, etc. and in particular, to a pink light emitting diode (comprising) comprises a blue LED chip and (mixing) mixed fluorescent powder material (, which converts the wavelength of light
10 emitted by a blue LED chip and emitted light) which includes a red fluorescent powder and yellow fluorescent powder.

DESCRIPTION OF THE RELATED ART

The light emitting diode (LED) has the advantages of being electricity-saving, high reliability, recyclable, and safety. Thus, it has been used widely in various
15 applications, such as an indicators and light sources. Recently light emitting diode for RGB (red, green (,) , and blue) colors having ultra-high luminance and high efficiency have been developed (,) . Large screen LED displays using these light emitting diode have been put into use. The LED display can be operated with less power and has such good characteristics as light weight and long life, and is
20 therefore expected to be more widely use in the future.

Please refer to FIG.1, it is a traditional LED lamp includes a blue LED chip 1, a lead frame 3, wires 4, a yellow fluorescent powder 8, and a compound layer 5.

The LED chip 1 is mounted on the lead frame 3. The wires 4 are electrically connected the LED chip 1 to the lead frame 3. The yellow fluorescent powder 8 is
25 coated on the LED chip 1. The compound layer (3) 5 is encapsulated on the LED chip 1 to finish the package of the LED.

A method of manufacturing LED is to use (d) various semiconductor materials to (emit different color of light) emit light of different wavelength. A traditional method of manufacturing (mixing) mixed light (of light emitting

diode) (, it is) used at least two chip to (different wavelength light) emit light of different wavelength, so as to mix various (wavelength light) light of different wavelength (to produces) may produce (mixing) mixed light as white light.

- 5 Further a traditional method of manufacturing (mixing) mixed light of light emitting diode (,) is to (providing) provide a fluorescent powder coated on the surface of the LED chip (,) . (t) The fluorescent powder is capable of absorbing a part of light emitted by LED chip ((as) eg. blue light (et.)), and emits light of (wavelength different) different wavelength from that of the
- 10 absorbed light to produce another kind of color light. Mixing the light emitted and the absorbed (is to) may produce a mixed light. (as white light (et.))

- At present time, a (mixing) mixed light is used to produce white light, which (is providing) provides a yellow fluorescent powder coated on the surface of a blue light LED chip to emit yellow light. Mixing the yellow light and
- 15 the blue light (to) may produce white light (,) , (For) for example, (the patent of a white light emitting diode (US 5998925) of Nichia Corporation) the US 5998925 patent of a white light emitting diode of Nichia Corporation.
- (please refer to FIG.2, is schematically illustrated color coordinate of CIE of a white light emitting diode (US 5998925 of Nichia Corporation.)

- 20 Furthermore, a method of manufacturing (mixing) mixed light is to mix a red fluorescent powder, blue fluorescent powder, and green fluorescent coated on a purple LED chip with a light wavelength (ranging from) in the range of 360nm-390nm to produce white light or various kinds of color light, for example, the (patent of) US 5952684 patent of Solidlite Corporation.

- 25 The method of manufacturing (mixing) mixed light of Nichia Corporation as above mentioned (, It) does not produce pink light emitting diode.

SUMMARY OF THE INVENTION

The objective of the present invention is to provide a pink white light

emitting diode. It is manufactured conveniently, therefore the manufacturing processes are simplified and the manufacturing cost must be decreased.

The further objective of the present invention is to provide a pink light emitting diode with a high luminance for a long period time.

5 To achieve the above-mentioned objective, a pink light emitting diode of the present invention comprises a blue LED chip and a (mixing) mixed fluorescent powder material (,which) that includes a yellow fluorescent powder and a red fluorescent powder, (is covered on the blue LED chip) wherein the yellow fluorescent powder (is capable of absorbing) which absorbs a part of blue light
10 emitted by the blue LED chip and (mixing) emits a yellow (wavelength) light, the red fluorescent powder (is capable of absorbing) which absorbs a part of blue light emitted by the blue LED chip and emits red light, to mix the blue light, yellow light, and red (wavelength) light (to produce) may produce pink light emitting diode.

15 According to (one) the aspect of the present invention, (a) the pink light emitting diode (can be manufactured and the manufacturing cost must be decreased) has the advantage of high stability (in useful) , lower cost, and high luminance for a long period of time.

BRIEF DESCRIPTION OF THE DRAWINGS

20 FIG 1 is a schematic illustration showing a traditional LED lamp.
(FIG 2 is a schematic illustration showing a color coordinate of CIE of a white light emitting diode (US 5998925) of Nichia corporation.)
FIG (3) 2 is a schematic illustration showing a pink light-emitting diode lamp of the present invention.
25 (FIG 4 is a schematic illustration showing a color coordinate of CIE of a pin light emitting diode of the present invention)

DETAILED DESCRIPTION OF THE INVENTION

Please refer to FIG. 2 (,) . It is a schematic illustration showing a pink light

diode lamp of the present invention includes a blue LED chip 10, a lead frame 20, wires 30, a [mixing] mixed fluorescent powder material 40, and a compound layer 50.

The blue LED chip 10 [is the emitting source, which may be emitted blue, 5 the blue LED chip 10 is mounted on the lead frame 20. In the embodiment, the blue LED chip has an emission light in a region of wavelength 425nm-455nm.] that emits a wavelength in a range of 425 nm – 455nm, the LED chip 10 is mounted on the lead frame 20.

The wires 30 are electrically connected [the blue LED chip 10 to lead 10 frame 20 for transmitting signals from the blue LED chip to the lead frame 20.] bonding pads of the LED chip 10 to the lead frame 20 for transmitting signal from the blue LED chip 10 to the lead frame 20.

The [mixing] mixed fluorescent powder material [,] which includes a yellow fluorescent powder and a red fluorescent powder, is [coated] formed on 15 the blue LED, wherein the yellow fluorescent powder [is capable of absorbing] which absorbs a part of blue light emitted by the blue LED chip 10 and emits a yellow light, the red fluorescent powder [is capable of absorbing] which absorbs a part of blue light emitted by the blue LED chip 10 and emits red light, to mix the blue light, yellow light, and red light [to] may produce pink 20 light emitting diode.

In the embodiment, the red fluorescent powder [has component of] is formed of $\text{Mg}_6\text{As}_2\text{O}_{11} : \text{Mn}$ or $3.5\text{MgO} \cdot 0.5\text{MgF}_2 : \text{Mn}$.

The red fluorescent powder [has component of] is formed of $\text{Y}_3\text{Al}_5\text{O}_{12} : \text{Ce}$ or $(\text{Y}_1\text{Gd})_3\text{Al}_5\text{O}_{12} : \text{Ce}$ [.] , S

[Please refer to FIG. 4, wherein the region of the color coordinate from pink 25 light emitting diode is to surround the coordinate of $(0.155 \cdot 0.03) \cdot (0.165 \cdot 0.2) \cdot (0.68 \cdot 0.32) \cdot (0.5 \cdot 0.48)$ of CIE]

The compound layer 50 is [covered] encapsulated on the blue LED chip 10,

wires 30, and mixed fluorescent powder material 40 (to protect the blue LED chip 10 and wires 30) .

[The method of manufacturing of the above-mentioned, is providing a mixing fluorescent powder 40, which includes a yellow fluorescent powder and a red fluorescent powder, is coated on the blue LED chip 10, wherein the yellow fluorescent powder is capable of absorbing a part of blue light emitted by blue LED, and emitting yellow wavelength light, the red fluorescent powder is capable of absorbing a part of blue light emitted by blue LED, and emitting red wavelength light, so that mixing the blue light, yellow light and red light to produce the pink light emitting diode.]

Therefore, the pink light emitting diode of the present invention has the following advantages.

1.Since the red fluorescent powder and yellow fluorescent powder are formed of (an) Oxide, the pink light emitting diode of the present invention has the advantage of high stability (in useful) , lower cost, and high luminance for a long period of time.

2.Since the manufacturing processes can be simplified, and the manufacturing costs also can be lowered.

While the invention has been described by the way of an example and in terms of a preferred embodiment, it is to be understood that the invention is not limited to the disclosed embodiment. On the contrary, it is intended to cover various modifications. Therefore, the scope of the appended claims should be accorded the broadest interpretation so as to encompass all such modifications.

25 IN THE CLAIMS

Canceled claim4.

Claim 1,2,3, and 5 have been amended as follows.

1.(once amended). A pink light emitting diode, comprising:
a blue LED chip ;

30 a (mixing) mixed fluorescent powder material (,) which includes a yellow

fluorescent powder and a red fluorescent powder, (being covered on the blue LED chip,) wherein the yellow fluorescent powder (capable of absorbing) which absorbs a part of blue light emitted by the blue LED chip and (emitting) emits a yellow light, the red fluorescent powder (capable of absorbing) which absorbs a part of blue light emitted by the blue LED chip and (emitting) emits red light, (so that mixing) to mix the blue light, yellow light, and red light (to) may produce pink light emitting diode.

2(once amended). A pink light emitting diode according to claim 1, wherein the blue LED chip (has as emission light in a region of wavelength
10 425nm-455nm) emits light of wavelength in the range of 425nm-455nm.

3(once amended). A pink light emitting diode according to claim 1, wherein the red fluorescent powder (has component) is formed of $\text{Mg}_6\text{As}_2\text{O}_{11} : \text{Mn}$ or $3.5\text{MgO} \cdot 0.5\text{MgF}_2 : \text{Mn}$.

(4(canceled). A pink light emitting diode according to claim 1, wherein the
15 region of the coordinate from pink light emitting diode is to surround the coordinate of $(0.155 \cdot 0.03) \cdot (0.165 \cdot 0.2) \cdot (0.68 \cdot 0.32) \cdot (0.5 \cdot 0.48)$ of CIE)

(5) 4(once amended). A pink light emitting diode according to claim 1, wherein the yellow fluorescent powder (has component) is formed of $\text{Y}_3\text{Al}_5\text{O}_{12} : \text{Ce}$ or $(\text{Y}, \text{Gd})_3\text{Al}_5\text{O}_{12} : \text{Ce}$ (.) , S

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ABSTRACT OF THE DISCLOSURE

A pink light emitting diode comprises a blue LED chip and a (mixing) mixed fluorescent powder material (The mixing fluorescent powder , which) that includes a yellow fluorescent powder and a red fluorescent powder, (is covered
25 on the blue LED chip) wherein the yellow fluorescent powder (is capable of absorbing) which absorbs a part of blue light emitted by the blue LED chip and (mixing) emits a yellow (wavelength) light, the red fluorescent powder (is capable of absorbing) which absorbs a part of blue light emitted by the blue

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LED chip and emits red light, to mix the blue light, yellow light, and red
[wavelength] light (to produce) may produce pink light emitting diode.
